I. INTRODUCTION

A. Background

Asphalt-concrete wearing course is located in the top layer of road asphalt. The composition of asphalt concrete wearing course which is a mixture that is designed for loads that have high durability capable of receiving all types of work load and pass it to the layer below. Indonesia's tropical climatic conditions as well as the increasing number of vehicle loads are often the main cause of deformation and cracking of the asphalt concrete layer - wearing course. That requires a mixture of asphalt that can improve road quality (*stability*) as well as the life of roads (*durability*) but still maintain the value of flexibility.

Over time a lot of studies on the pavement in terms of both the tools to substitute or additive materials. Substitute materials or substances can be added from the natural surroundings and from the remnants of waste that can be recycled, such as natural rubber, scrap tires and crumb rubber. The materials used depend on the needs and objectives aim, as a substitute or as an additive and to improve road quality *(stability)* as well as the life of roads (*durability*) by mixing these materials into aggregates or into the binder. The mixture of materials for road pavement require an engineered in order to meet the quality requirements of targeted mix.

The mixture used in this thesis uses crumb rubber from tire retreading. Crumb Rubber is a waste tire recycling process is processing through crumb stage. *Mc Quillen and Hicks* (1987) states that the addition of *crumb rubber* in asphalt of advantages to the viscosity value compared with conventional asphalt, the surface is more elastic and also more durable. According to *Wahyu Purnomo*, (2013) has the advantage of adding *crumb rubber* asphalt mixture resistance to water, withstand heavy traffic loads, and more flexible.

Related to this, the researchers will conduct a further study on "Influences of Crumb Rubber on The Durability and Marshall Characteristics of Asphalt Concrete" using crumb rubber derived from tire retreading with levels of 5% through sieve number 200 as the binder to see the value Masrhall and durability.

B. Problem Statement

Based on the reasons on the background of the study,the writer proposes the following statements :

1. How the influences of *crumb rubber* on the *asphalt concrete* properties using *Marshall Test*?
2. How the *durability* performance of Asphalt Concrete – Wearing Course stabilized using *crumb rubber*?

C. The Purpose of Research

Purpose of the research is as follows :

1. Analysis the influences of *crumb rubber* on the *asphalt concrete* properties using *Marshall Test*
2. To investigate the *durability* performance of Asphalt Concrete – Wearing Course stabilized using *crumb rubber*.

D. Benefit of The Study

The research paper is expected to give some benefits. In this research, the researcher breaks down the benefit in to three parts as follows :

1. Utilize added crumb rubber as the material of asphalt concrete.
2. Knowing how mixing asphalt with crumb rubber in asphalt mixture AC-WC.
3. As a reference in teaching and research that further.

E. Limitation of The Study

The research is limited by researcher of some points to be focused and targeted as follows :

1. Research conducted at Civil Engineering laboratory of Surakarta Muhammadiyah University.
2. Aggregate gradation used is *AC - WC* specification.
3. The mixture specification uses Bina Marga 2010 Revision 3.
4. This research uses asphalt penetration 60/70 from PT. Pertamina.
5. Fine aggregate and coarse aggregate from AMP Boyolali.
6. Crumb Rubber pass sieve number 200, and the crumb rubber content 5% as the binder.

F. Originality of The Study

The research under title "Influences of Crumb Rubber on The Durability and Marshall Characteristics of Asphalt Concrete" this research has never been done by previous research,but there is some research which has similarity with this research :

1. Rachmayati, Dina, 2010, UNS. Asphalt Properties Evaluation of Asphalt-Crumb Rubber Mix as an Alternative Substitution of Petroleum Asphalt. She only does testing on asphalt.
2. Ramadan, Indra, 2013, UGM. Utilization Laboratory Studies Crumb Rubber Asphalt as Materials Added toThe Stability and Durability of The Mixed Asphalt Concrete – Wearing Course. He tested the mixture with several variations of crumb rubber content passing filter no.100 retained no. 200.
3. Nuha Salim, Al, 2013. Performance Evaluation of Crumb Rubber Modified Stone Mastic Asphalt Pavement in Malaysia. He uses a mixture of stone Mastic Asphalt (SMA).

G. Similarities and Differences with a type of Research

Similarities and differences with previous studies of this research can be seen in Table I.1. below :

Table I.1 Similarities and Differences with a type of Research

Description	**The proposed research**	**Dina (2010)**	**Indra (2013)**	**Nuha Salim (2013)**
Title	Influences of Crumb Rubber on The Durability and Marshall Characteristics of Asphalt Concrete.	Asphalt Properties Evaluation of Asphalt-Crumb Rubber Mix as an Alternative Substitution of Petroleum Asphalt.	Utilization Laboratory Studies Crumb Rubber Asphalt as Materials Added toThe Stability and Durability of The Mixed Asphalt Concrete – Wearing Course.	Performance Evaluation of *Crumb Rubber* Modified Stone Mastic Asphalt Pavement in Malaysia.

Purpose	To investigate the *durability* performanc e of Asphalt Concrete – Wearing Course stabilized using *crumb rubber* and the influences of *crumb rubber* on the *asphalt concrete* properties using *Marshall Test*	Determine the process of making the mixture *crumb rubber* asphalt, so it can be used as a reference in the production process- *crumb rubber* asphalt mixture is homogeneous . Analyze and explain the effect of increasing the size and percentage of *crumb rubber* to asphalt mixture properties of *asphalt-rubber crumb.*	Knowing the stability of the mixture of *Asphalt Concrete – Wearing Course* addition of *crumb rubber* with a mix of conventional *Asphalt Concrete – Wearing Course.*	To Investigate the Effect of Adding Crumb Tyre Rubber as an Addictive to SMA Mixture Performance Properties.

This research tries to investigate the *durability* performance of Asphalt Concrete – Wearing Course stabilized using *crumb rubber* and to analysis the influences of *crumb rubber* on the *asphalt concrete* properties using *Marshall Test*. That this research has never been done before especially in Civil Engineering department, faculty of engineering University of Muhammadiyah Surakarta.